

Three Aspects of Green Bonds

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Overview

- Motivation and Research Questions
- Related Literature
- Data and Methodology
- Results and Discussion
- Conclusion

Motivation

ESG Investing and Green Bonds

- Boom in ESG investing in recent years.
- Green bonds market till 2020 was >1 Trillion USD, and governments and companies have decided to invest 500 Billion USD more in this asset class.
- Form of institutions issuing green bonds - Corporate, SSA (Supranational, Sovereign, and Governmental), Municipal, Project, and ABS/MBS.
- High proportion of corporate green bonds.

Motivation

'Green' in Green Bonds

- Renewable Energy - Solar, wind, hydro, and similar others.
- Energy efficiency - Fuel cells, energy storage, electric vehicle, LED, and similar others.
- Green Building and infrastructure - LEED certified buildings, energy efficient social infrastructure, and similar others.
- Agriculture forestry - Reforestation, afforestation, land use, and similar others.
- Other sustainability - Climate change adaptation/mitigation, waste management, clean water, pollution control, and similar others.

Research Questions

Three 'Aspects' of Green Bonds

Who issues green bonds ?

How shareholders react to green bonds announcements in different countries ?

Who supports the green bonds issuance ?

Related Literature

- Tang and Zhang (2020)
 - Positive market reaction to the issuance of green bonds.
 - No premium found.
 - Stock liquidity and domestic institutional ownership increases post-issuance.
- Flammer (2021)
 - Investors react positively to the announcement of green bond issuance, and the response is stronger for first-time issuers and bonds certified by third parties.
 - Issuers improve their environmental performance post-issuance (i.e., higher environmental ratings and lower CO2 emissions), and experience an increase in ownership by long-term and green investors.

- Signaling - Using green bonds, companies can signal their commitment towards the environment.
- Greenwashing - Firm can make false claims about the environmental commitments, provide selective disclosure, dubious eco-labels, misleading visual imagery, and misleading narratives.
- Cost of debt- Green bond investors are willing to accept lower yields for the greater good of fighting climate change, green bonds may represent a cheaper source of financing.

- Bloomberg fixed income database - 3,486 Green bonds from 1st January 2013 to 31st December 2018.
- Excluding bonds by supranational, government, and similar other agencies - 1,189 Green Bonds
- Major green bonds issuer countries are China, United States, Sweden, France, Netherlands, and Germany.
- The firm characteristics and environment related variables are collected from Worldscope and Asset4 databases.
- The institutional ownership data is from the Factset Ownership database.

Data (Continued)

- Green bonds are mainly concentrated in few sectors – energy (229 green bonds), financials (554 green bonds), utilities (293 green bonds), and industrials (75 green bonds).
- 36 % of total corporate green bonds in the sample are issued in emerging markets.
- 263 are issued by public firms directly remaining 926 bonds are issued by either private firms or private subsidiaries of public firms.
- In US and Europe, less number of issuers issue more green bonds. For instance, out of 191 US green bonds, 140 are issued by a private subsidiary of Tesla. Similar pattern is prevalent in Europe.

Data (Continued)

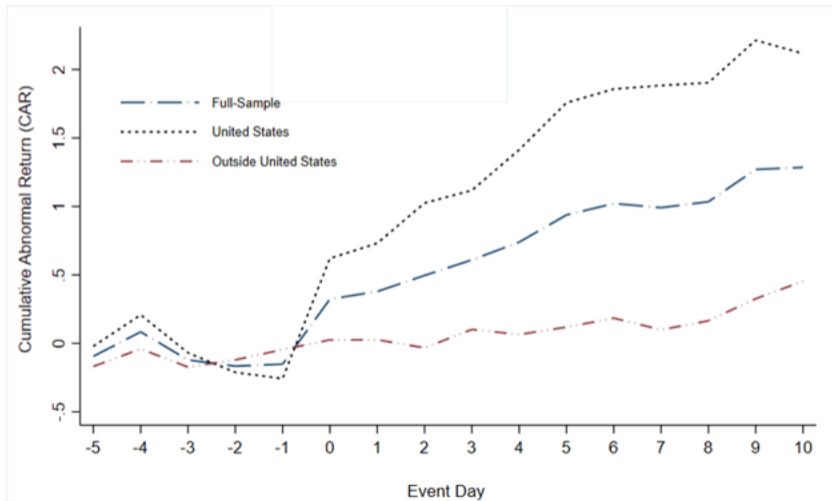
- From 1,189 bonds in the sample, 864 are approved by Climate Bond Initiative (CBI) or through a third-party ESG assurance provider.
- 75 % (887) of bonds in the sample expires at maturity, and 25 % of bonds include options such as call, put, sink, and convertible.
- Most of them have a maturity of 3, 5, 7, or 10 years.

Bond Level Summary

	(1)	(2)	(3)
	All	Private	Public
# Green Bonds	1189	552	637
# Green bond issuer-days	729	343	386
# Green bond issuer-years	512	287	225
# Green bond issuers	393	224	169
Coupon (in %)	3.317	3.293	3.339
	(2.376)	(2.481)	(2.281)
Amount Issued (in million USD)	247	243	252
	(422)	(312)	(499)
Maturity (in years)	7.979	7.99	7.969
	(29.542)	(6.743)	(39.927)
Certified (in %)	68	76	62
Rating	AA-	AA-	AA-

Results

Market Reaction to Green Bonds Issuance



Results (Contd.)

Market Reaction to Green Bonds Issuance - CAR (-5, 10)

Index	Country	Mean	SE.	T-Stats
1	Australia	0.221	0.587	0.376
2	Austria	1.187	3.234	0.367
3	Brazil	-0.557	2.85	-0.196
4	China	-0.163	0.893	-0.183
5	France	-0.235	0.474	-0.495
6	Germany	-2.79	2.547	-1.096
7	Hong Kong	-0.613	2.189	-0.28
8	India	3.941	3.275	1.203
9	Japan	-0.194	0.876	-0.222
10	Malaysia	-1.452	1.33	-1.092
11	Netherlands	1.568	1.039	1.509
12	Norway	-1.819	2.429	-0.749
13	Singapore	-0.251	1.071	-0.234
14	Spain	-1.209	1.922	-0.629
15	Taiwan	-0.182	0.947	-0.192
16	UK	0.136	1.235	0.11
17	Sweden	2.013***	0.723	2.785
18	Italy	1.502	1.762	0.852
19	United States	2.1164*	1.247	1.697

Results (Contd.)

Sample Extension and Alternate Green Bonds

- Extended sample - Even US market reaction is negative and significant.
- Alternate green bonds (118 unique events)
 - Sustainability bonds: -ve market reaction (significant)
 - Social bonds: +ve market reaction (insignificant)
 - Sustainability-linked bonds: -ve market reaction (significant)

Results (Contd.)

- Matching green bonds with non-green bonds based on country, industry, year, and firm fundamentals.
- Difference-in-Difference regression:

$$Y_{firm,Year} = \alpha_{firm} + \alpha_{Country} \times \alpha_{Year} + \alpha_{Industry} \times \alpha_{Year} + \beta \text{ GreenBond}_{firm,Year} + \epsilon_{firm,Year}$$

The dependent variable (Y) is environmental score, ESG score, log of carbon emissions, target emissions, total institutional holding, and domestic institutional holding.

Results (Contd.)

Who issues Green Bonds ?

VARIABLES	(1) Environmental Score	(2) ESG Score	(3) Log Emissions	(4) Target Emissions
Green Bond	-1.012* (0.466)	-0.523*** (0.076)	0.024** (0.010)	-0.002*** (0.000)
Constant	56.540*** (0.162)	56.503*** (0.026)	11.586*** (0.003)	0.328*** (0.000)
Observations	1,068	1,068	659	1,068
R-squared	0.997	0.998	1	0.988
Firm	Yes	Yes	Yes	Yes
Country-Year	Yes	Yes	Yes	Yes
Industry-Year	Yes	Yes	Yes	Yes
Cluster(Industry)	Yes	Yes	Yes	Yes

Results

Who supports green bonds issuance ?

	Full Sample	China	United States	France	Sweden
VARIABLES	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding	Inst.Inv. Holding
Green Bond	0.003**	-0.002***	0.001	-0.008	0.022***
	(0.001)	0.00	(0.001)	(0.006)	(0.000)
Constant	0.389***	0.044***	0.675***	0.272***	0.285***
	(0.001)	(0.000)	(0.000)	(0.002)	0.00
Observations	842	58	290	71	32
R-squared	1.000	1.000	1.000	0.999	0.998
Firm	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Country-Year	Yes	No	No	No	No
Industry-Year	Yes	Yes	Yes	Yes	Yes
Cluster(Industry)	Yes	Yes	Yes	Yes	Yes

Results

Who supports green bonds issuance ?

VARIABLES	Full Sample			China			United States			France			Sweden		
	Inst.	Hold.	Domestic	Inst.	Hold.	Domestic	Inst.	Hold.	Domestic	Inst.	Hold.	Domestic	Inst.	Hold.	Domestic
Green Bond		0.007*	(0.003)		0.000***	(0.000)		0.002	(0.002)		-0.001**	(0.000)		0.016***	(0.000)
Constant		0.237***	(0.001)		0.016***	(0.000)		0.549***	(0.001)		0.061***	(0.000)		0.126***	(0.000)
Observations		842			58			290			71			32	
R-squared		1.000			1.000			0.999			1.000			0.998	
Firm		Yes			Yes			Yes			Yes			Yes	
Year		No			Yes			Yes			Yes			Yes	
Country-Year		Yes			No			No			No			No	
Industry-Year		Yes			Yes			Yes			Yes			Yes	
Cluster(Industry)		Yes			Yes			Yes			Yes			Yes	

Conclusion

Who issues green bonds ?

Firms using green bonds as a tool to signal that the future environment performance would be better. Firms with low environment score and low ESG score issues more green bonds.

How shareholders react to green bonds announcements in different countries ?

Overall, the market reaction is negative for green bonds as well as for alternate green bonds signifying that the shareholders believe it as 'green washing'.

Who supports the green bonds issuance ?

Only domestic institutional investors support this asset class (home-bias effect) and not foreign institutional investors (asymmetric information).

Thank You